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RHOPALOMYIA LAWRENCIAE, A NEW GALL MIDGE SPECIES (DIPTERA: CECIDOMYIIDAE) DEFORMING LEAVES OF *LAWRENCIA SQUAMATA* (MALVACEAE) IN SOUTH AUSTRALIA

by Peter Kolesik*

Summary

KOLESIK, P. (1998) *Rhopalomyia lawrenciae*, a new gall midge species (Diptera: Cecidomyiidae) deforming leaves of *Lawrencia squamata* (Malvaceae) in South Australia. *Trans. R. Soc. S. Aust.* **122**(4), 139-145, 30 November, 1998.

A new gall midge, *Rhopalomyia lawrenciae*, is described from swollen leaves of *Lawrencia squamata* collected on Hindmarsh Island in the River Murray estuary, South Australia. Inside each of the infested leaves is a chamber occupied by one larva of the new species. Males, females, pupae and larvae of the gall midge are described. All specimens of the host plant lodged in the State Herbarium of South Australia were examined for galls and this revealed a wide geographic distribution throughout the state. A key to adults of the three known *Rhopalomyia* species occurring in Australia, *R. lawrenciae*, *R. goodeniae*, a native species damaging stems of *Goodenia lunata* and *R. californica*, an introduced American species damaging flower buds of *Baccharis halimifolia*, is provided.

KEY WORDS: Gall midge, Cecidomyiidae, *Rhopalomyia lawrenciae*, *Lawrencia squamata*, saltmarsh flat, River Murray, South Australia.

Introduction

Lawrencia is an Australian plant genus comprising 12 species of perennial herbs and small shrubs (Jessop 1986). *Lawrencia squamata* Nees in Lehm. is a rigid shrub up to 1 m high, occurring in all mainland states (Jessop 1986). In South Australia, it grows on saltmarsh flats, sand dunes and rocky cliffs along the coast and on sandy soils and marshes inland. The plant forms part of the shore vegetation on the saltmarsh flats in the estuary of the River Murray where in September, 1996, on the south-eastern coast of Hindmarsh Island, many leaves of *L. squamata* were found to be swollen (Fig. 1). The swellings were caused by larvae of an unknown gall midge described here. The new species is placed in *Rhopalomyia*, a large, worldwide genus. The new species becomes the second gall midge described from South Australian saltmarsh flats, the first, *Asphondylia inflata* Kolesik (1997) having been described last year.

Materials and Methods

Branches of *Lawrencia squamata* plants bearing leaf galls were collected on Hindmarsh Island, South Australia on 8 September, 1996. The branches were brought to the laboratory and the galls processed in one of two ways. A small number was dissected and the larvae and pupae were preserved in 70% ethanol. A larger number was left on the branches and kept in plastic bags to develop to adults. Pupation took place within the galls. Emerged adults were preserved in 70% ethanol after their colour had been noted. Canada balsam mounts of type specimens were prepared according to the technique outlined by Kolesik (1995). The type series, and other material retained in 70% ethanol, are deposited in the South Australian Museum, Adelaide [SAMA] and the Australian National Insect Collection, Canberra

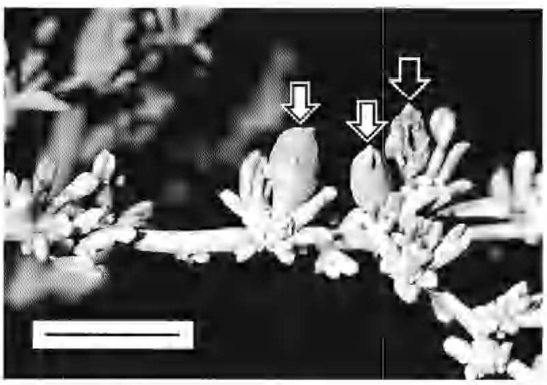

Fig. 1. Galls of *Rhopalomyia lawrenciae* sp. nov. on *Lawrencia squamata*. White arrows mark whole galls, black arrow marks a gall cut open, presumably by birds. Scale bar = 10 mm.

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[ANIC]. A dried sample of an infested plant is deposited in the State Herbarium of South Australia, Adelaide [SHSA]. All measurements refer to the holotype and paratypes. Investigation of the geographic distribution of the new species was based on examining the presence of galls on dried specimens of the host plant deposited in SHSA. The galls were easily recognisable and some still contained pupal skins of the new gall midge.

Genus *Rhopalomyia* Rübsaamen, 1892

Rhopalomyia Rübsaamen, 1892: 370
Type species: *Oligotrophus tanaceticola* Karsch, 1879: VII. Jber. westf. Prov.Ver. Wiss. Kunst: 27 (des. Kieffer, 1896: 89)

Rhopalomyia is a large, worldwide genus of the tribe Oligotrophini with an undivided eighth female abdominal tergite and completely setulose gonostylus. Most of the known species have a one- to three-segmented palpus, and one species, the Australian *R. goodeniae* Kolesik (1996), has a three- or four-segmented palpus.

Rhopalomyia lawrenciae sp. nov.
(Figs 1-19)

Holotype: ♂, Hindmarsh Island, South Australia [35° 33' S, 138° 53' E], 9.ix.1996, P. Kolesik, reared from a leaf gall on *Lawrencia squamata* Nees in Lehm., gall collected 8.ix.1996, [SAMA, I21394].

Paratypes: 2♂♂, 3♀♀, 3 pupae [SAMA, I21395-I21401], 2♂♂, 2♀♀, 2 pupae [ANIC], same data but emerged 8-17.ix.1996; 3 larvae, [SAMA, I21402-I21405]; 3 larvae [ANIC], collected with holotype.

Other material: 27♂♂, 18♀♀, 8 pupae, 11 larvae [SAMA], same data as paratypes; gall, collected with holotype, A19960343/67 [SHSA].

Male (Figs 2-7)

Colour: head and thorax brown, abdomen with sclerotised parts brown and non-sclerotised parts grey.

Head: Antennal scape broadest distally, as long as distal breadth, 1.5x length pedicel; pedicel broader than long; flagellomeres 13-14 in number, first and second not fused, neck about 1/6 length node; circumfila comprising two transverse and two longitudinal bands. Palpus three-segmented. Eye facets rounded, close together, sparser at vertex, eye bridge 5-6 facets long. Labella roughly hemispherical, laterally with 2-5 setae. Frons with 12-20 setae per side.

Thorax: Wing length 2.2 mm (1.9-2.4, n = 5), width 1.0 mm (0.8-1.1); R_5 same thickness entire length, slightly curved posteriorly, joining C anterior to apex; R_1 joining C near wing mid-length; Sc cell pigmented and together with R_1 and adjacent part of R_5 bearing scales. Claws toothed, empodium as long as claws, pulvilli half length empodium.

Abdomen: All tergites with pair of sensory setae in anterior corners and row of setae posteriorly, tergites 7 and 8 additionally with few setae scattered mesolaterally; sternites 2-8 with pair of sensory setae anteriorly, a row of setae posteriorly and a band of setae mesally. Genitalia: gonocoxites cylindrical, ventral articulation with gonostylus longer than dorsal articulation, setose and setulose; gonostylus about same width entire length, setose and setulose throughout, with strong tooth, comblike distally; cerci separate, setose and setulose; hypoproct bilobed, with one seta apically on each lobe, setulose; parameres setulose, with 6-8 setose apical papillae; aedeagus conical.

Female (Figs 8-13)

Colour: head and thorax brown, abdomen with sclerotised parts brown and non-sclerotised parts red.

Head: Flagellomeres 12-13 in number, terminal ones sometimes fused, neck about 1/10 length node.

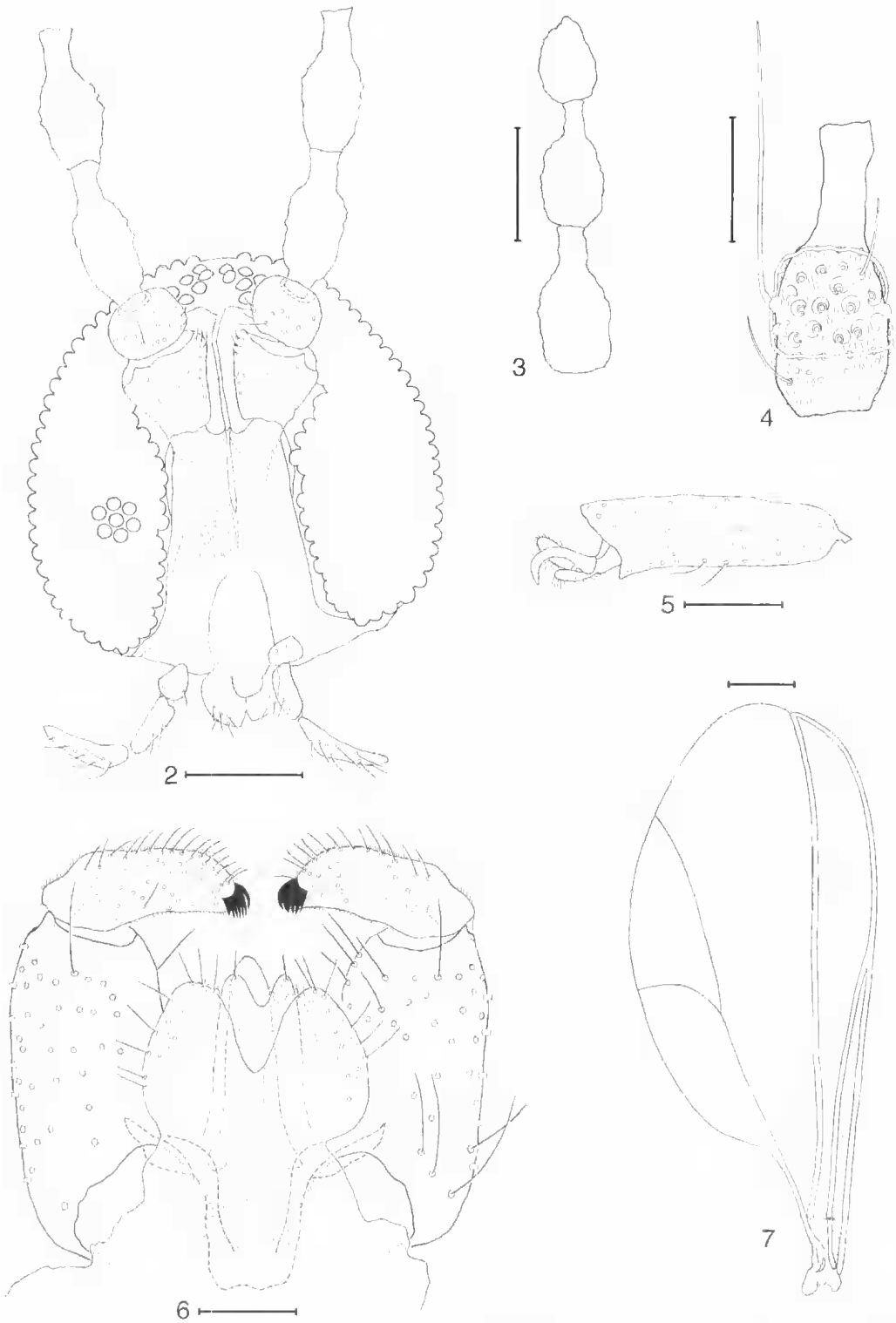
Thorax: Wing length 2.0 mm (1.4-2.3, n = 5), width 0.8 mm (0.6-0.9). Tergite 8 with single pair of sensory setae anteriorly, sclerotisation undivided, in shape of letter "x". Ovipositor: cerci fused into single, terminal spheroid lamella, setose and setulose; hypoproct rounded apically in dorso-ventral view, bearing two setae posteriorly, setulose. Other characters as in male.

Pupa (Figs 14-16)

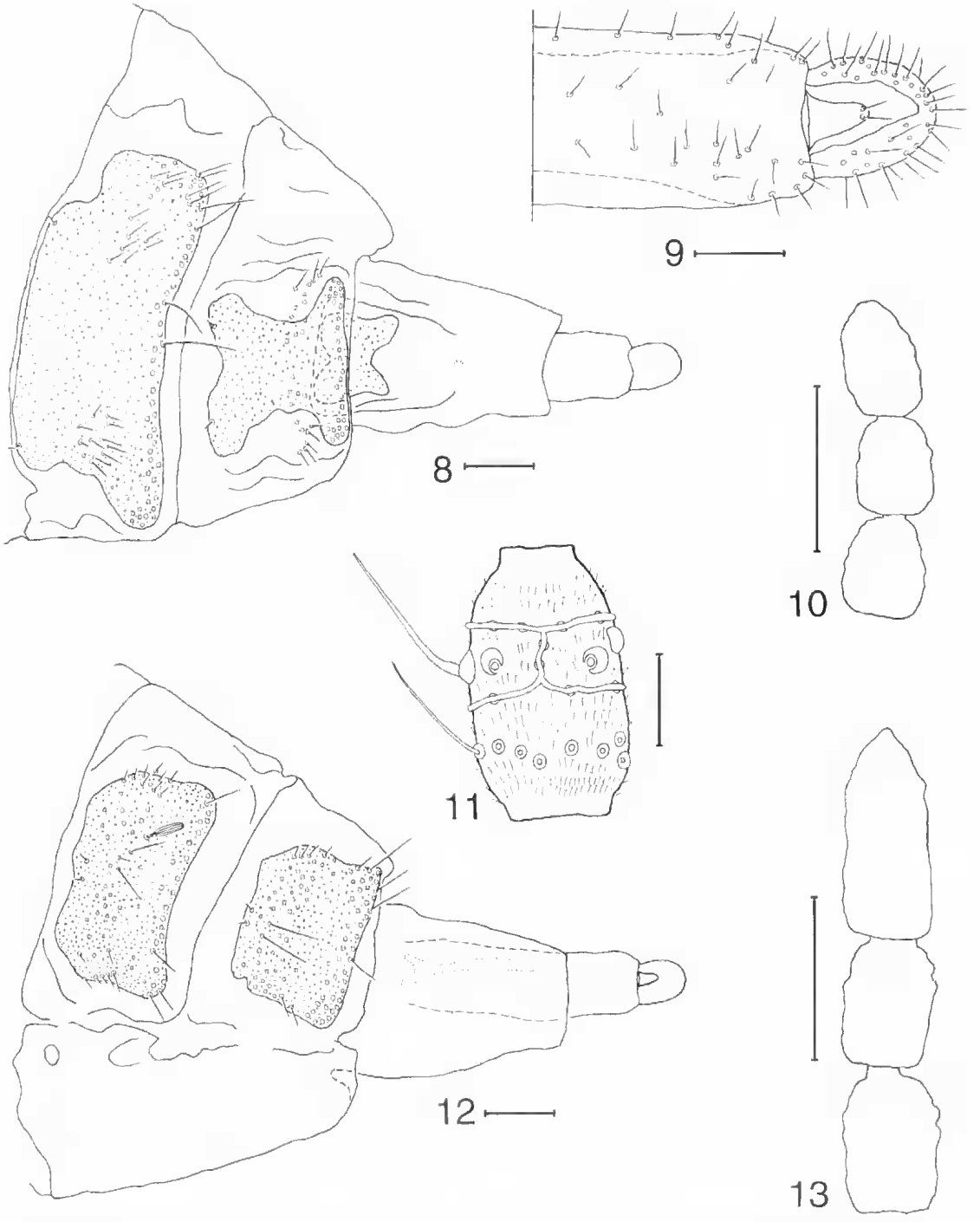
Colour: antennal and frontal horns pigmented, brown, remaining parts unpigmented. Length 2.6 mm (2.5-2.8, n = 5). Antennal horns strong, bifid, 191 µm (172-206) long. Frons on each side: one frontal horn, pair of papillae on lower face, one setose, one asetose, triplet of lateral facial papillae, one setose, two asetose. Prothoracic spiracle with several irregular protuberances apically, trachea ending between half and distal third of spiracle. Integument of abdominal segments covered with spicules, very dense dorsally, no dorsal spines present.

Last instar larva (Figs 17,18)

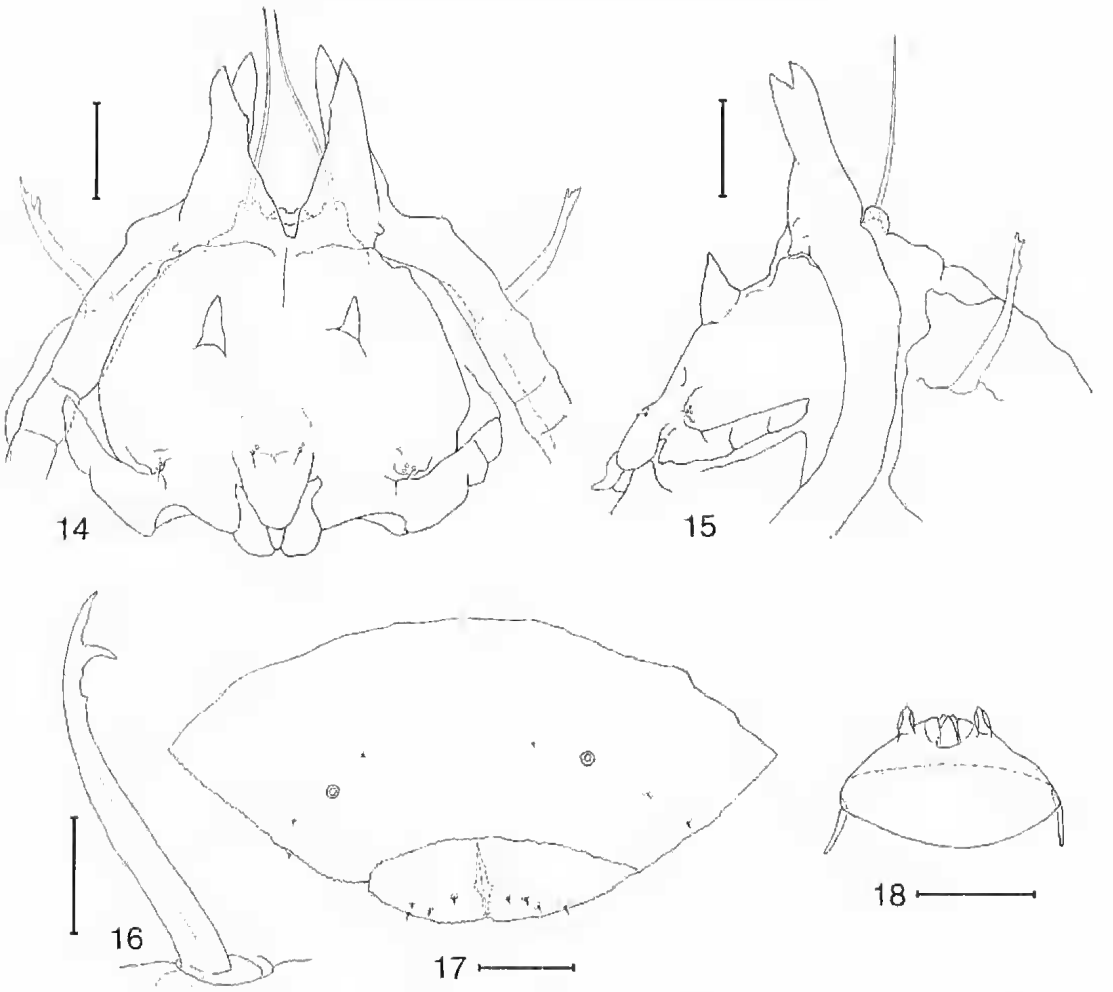
Colour: pinkish red. Length 2.5 mm (2.5-2.6, n = 6). Integument covered with spicules. Head with postero-lateral apodemes shorter than head length. No spatula present. All papillae with short setae. Thoracic and first abdominal segments with pair of ventral papillae, two pairs of pleural papillae, three pairs of dorsal papillae. Abdominal segment 8 with pair of ventral papillae, two pairs of pleural papillae,



Figs. 2-7. Male of *Rhopalomyia lawrenciae* sp. nov. 2. Head in frontal view. 3. Last three flagellomeres. 4. Sixth flagellomere. 5. Last tarsomere with claw, empodium, and pulvillus. 6. Genitalia in dorsal view. 7. Wing. Scale bars = 100 μm 2, 3; 50 μm 4-6; 200 μm 7.



Figs 8-13. Female of *Rhopalomyia lawrenciae* sp. nov. 8. Posterior end of abdomen in dorsal view. 9. Posterior end of ovipositor in ventral view. 10. Last three flagellomeres (paratype 121397). 11. Sixth flagellomere. 12. Posterior end of abdomen in ventral view. 13. Last three flagellomeres (paratype 121398). Scale bars = 100 μm 8, 10, 12, 13; 50 μm 9; 25 μm 11.



Figs 14-18. *Rhopalomyia lawrenciae* sp. nov.: 14-16, pupa. 17,18, larva. 14. Anterior part in ventral view. 15. Anterior part in lateral view. 16. Prothoracic spiracle. 17. Two terminal segments in dorsal view. 18. Head capsule. Scale bars = 100 μm 14, 15, 17; 50 μm 16, 18.

pair of dorsal papillae. Terminal segment with four pairs of terminal papillae. Anus ventral.

Etymology

The specific name means "of *Lawrencia*", the host plant.

Gall and biology

Leaves of *Lawrencia squamata* infested by this gall midge are several times larger than normal in volume, 4-6 mm long and 3-4 mm wide (Fig. 1). Each gall contains a chamber occupied by one larva. The chamber wall is lined with a thin, hard, pale-brown layer of tissue at the time the larva is fully-grown.

Pupation takes place inside the gall. The pupa raises two thirds of its body outside the gall before the adult breaks through the anterior end of the pupa. On 8 September, 1996, on the southeastern coast of Hindmarsh Island (Fig. 19), the galls contained larvae and pupae, with the first adults already emerging. On this occasion, the host plants were about 20 cm high and about 50 cm in diameter and approaching the end of flowering. *Lawrencia squamata* accounted for some 10% of the ground covering of the dense, herbal, coastal vegetation at this locality. The population density of the new gall midge was high, comprising up to 10 galls per host plant. Many galls were found cut open, possibly by birds, a phenomenon described for other cecidomyiid galls previously (Struble & Osgood 1976; Tscharntke 1990).

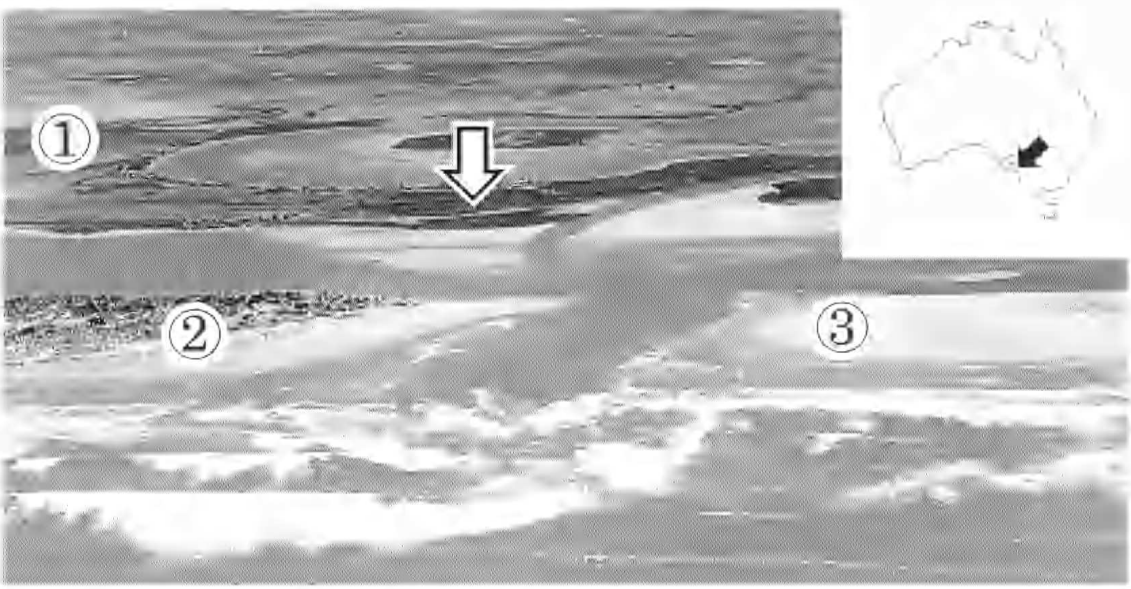


Fig. 19. Hindmarsh Island, South Australia – aerial view at the type locality of *Rhopalomyia lawrenciae* spec. nov. 1. Hindmarsh Island, 2. Sir Richard Peninsula, 3. Younghusband Peninsula. White arrow marks the type locality.

Geographic distribution

Galls of the new gall midge were found on *Lawrencia squamata* plants collected from the following localities in South Australia: N-W of Marla [27° 20' S, 133° 20' E], track to Fisher [31° 20' S, 130° 54' E], 15 km W of Nullarbor [31° 27' S, 130° 44' E], 30 km S of Eyre Highway [31° 47' S, 131° 52' E], 4 km S of Coorabie [31° 56' S, 132° 18' E], Port Sinclair [32° 07' S, 132° 59' E], Thevenard [32° 09' S, 133° 10' E], Smoky Bay [32° 18' S, 133° 50' E], Violet Post Office [32° 22' S, 135° 31' E], Mt Ive Station [32° 25' S, 135° 50' E], Carrieton [32° 26' S, 138° 32' E], Egg Island [32° 28' S, 139° 19' E], Dog Island [32° 29' S, 133° 20' E], 18 km N of Ellison [33° 30' S, 134° 53' E], St Francis Island [32° 31' S, 133° 18' E], Masillon Island [32° 54' S, 133° 17' E], Penalun Island [32° 55' S, 133° 17' E], Redcliff Survey Area* [32° 43' S, 137° 51' E], Streaky Bay [32° 48' S, 134° 13' E], 6 km E of Canegrass [33° 35' S, 140° 05' E], Ellison [33° 39' S, 134° 53' E], Cowell [33° 41' S, 136° 55' E], Burra Creek Plain (18 km N of Mt Mary) [33° 53' S, 139° 26' E], W side of Lake Hamilton [33° 57' S, 135° 16' E], Port Hughes [34° 05' S, 137° 33' E], Mt Mary [34° 06' S, 139° 26' E], Adelaide Outer Harbour [34° 48' S, 138° 30' E], West Cape (Innes National Park) [35° 15' S, 136° 50' E], Minlaton [34° 46' S, 137° 36' E], Port Lincoln [34° 44' S, 135° 52' E], Formens Island [34° 48' S, 138° 32' E], Port Adelaide [34° 50' S, 138° 30' E], Port Noarlunga [35° 09' S, 138° 29' E], Pondalowie Bay [35° 14' S, 136° 50' E], Hindmarsh Island [35° 31' S, 138° 50' E], Malinong [35° 31' S, 139° 31' E], 18 km N of Meningie [35° 37' S, 139° 20' E], Vennachar Point (Kangaroo Island) [35° 53' S, 136° 42' E], Coorong [36° 18' S, 139° 43' E].

The highest abundance of galls was found on plants collected 3.x.1972 by N. M. Wace on the exposed rocky headland of Dog Island where plants were subject to salt spray during storms. The plants from this area which are deposited in SHSA are rigid, dense shrubs, about 100 mm high and 150 mm in diameter, each bearing some 100 galls of the new gall midge. Other locations with a high abundance of galls were The Coorong (plants collected 1.x.1961 by M. C. R. Sharrad) and Adelaide Outer Harbour (plants collected 7.xi.1971 by A. G. Spurmer).

Remarks

Rhopalomyia is a "catch-all" genus with most of its species forming galls on plants of the family Asteraceae. There are two distinctive morphological groups in the genus, one contains species that have larvae with spatula absent and pupae with antennal horns present; the other contains species that have larvae with spatula present and pupae with antennal horns absent (Gagne 1994). The new species belongs to the former group. The only other known Australian native *Rhopalomyia*, *R. goodeniae* Kolesik 1996), a species deforming stems of *Goodenia lunata* J. Black (Goodeniaceae) in the Lake Eyre region, belongs to the latter group. Both species belong to Sylvén's (1975) biological group V of primary gall inducers with larvae feeding

solitarily and pupation taking place in the gall. The gall of *R. goodeniae* comprises a conglomerate of individual chambers whereas the gall of *R. lawrenciae* sp. nov. consists of a single chamber. Because only these two species of *Rhopalomyia* are known to be native to Australia, it is too early for a general characterisation of the genus on this continent. Below, a key is given to adults of the two native species and *R. californica* Felt, an American species introduced into Australia to control *Baccharis halimifolia* L. (Asteraceae) (McFadyen *et al.*[1]; Gagné & Boldt 1995).

Key to adults of Australian species of *Rhopalomyia*

1. Tarsal claws toothed.....*R. lawrenciae*
   Tarsal claws simple.....2
2. Palpus with 3 or 4 segments; length of papillae on male parameres $^1/_5$ - $^1/_2$ paramere width.....*R. goodeniae*
   Palpus with 1 or 2 segments; length of papillae on male parameres about $^1/_{20}$ paramere width.....*R. californica*

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